

# 8.4

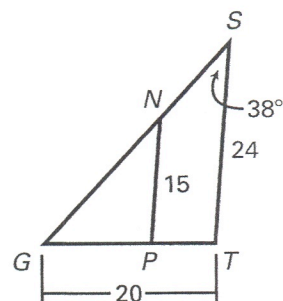
## Similar Triangles

- Goals**
- Identify similar triangles.
  - Use similar triangles in real-life problems.

### Example 1 Writing Proportionality Statements

In the diagram,  $\triangle GST \sim \triangle GNP$ .

- Write the statement of proportionality.
- Find  $m\angle GNP$ .
- Find  $GP$ .



#### Solution

a.  $\frac{GN}{\square} = \frac{GP}{\square} = \frac{NP}{\square}$

b.  $\angle NST \cong \angle GNP$ , so  $m\angle GNP = \square^\circ$ .

c.  $\frac{NP}{\square} = \frac{GP}{\square}$  Write proportion.

$\frac{15}{\square} = \frac{GP}{\square}$  Substitute.

$\frac{\square(15)}{\square} = GP$  Multiply each side by  $\square$ .

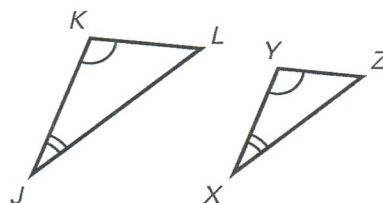
$\square = GP$  Simplify.

Answer So,  $GP$  is  $\square$  units.

### POSTULATE 25: ANGLE-ANGLE (AA) SIMILARITY POSTULATE

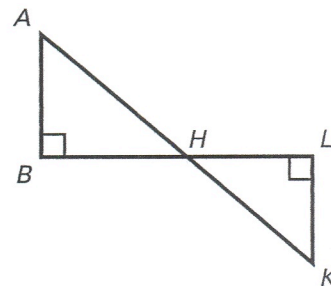
If two angles of one triangle are congruent to two angles of another triangle, then the two triangles are similar.

If  $\angle JKL \cong \angle XYZ$  and  $\angle KJL \cong \angle YXZ$ ,  
then  $\triangle \square \sim \triangle \square$ .



**Example 2** *Proving that Two Triangles are Similar*

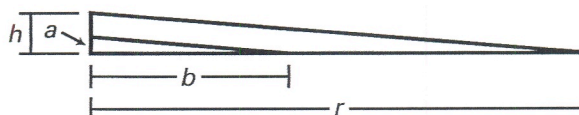
In the diagram,  $\triangle ABH \sim \triangle K LH$ . Use properties of similar triangles to explain why these triangles are similar.

**Solution**

You can use the Vertical Angles Theorem to determine  $\angle AHB \cong \angle \underline{\hspace{1cm}}$ . Because they are right angles,  $\angle ABH \cong \angle \underline{\hspace{1cm}}$ . By the                                 , you can conclude that  $\triangle ABH \sim \triangle K LH$ .

**Example 3** *Using Similar Triangles*

To comply with the Americans with Disabilities Act, wheelchair ramps made for new constructions must have a height to length ratio of 1 : 12. At a new construction, the height  $h$  to the bottom of a door is 2.5 feet. Use the proportion  $\frac{a}{b} = \frac{h}{r}$  to estimate the length  $r$  that the ramp should be to have the correct slope ratio. In the proportion, use  $a = 1$  ft and  $b = 12$  ft.

**Solution**

$$\frac{a}{b} = \frac{h}{r}$$

Write proportion.

$$\frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}} = \frac{\boxed{\phantom{000}}}{r}$$

Substitute.

$$r = \underline{\hspace{1cm}} \text{ ft}$$

Cross product property

**Answer** The ramp should have a length of            feet.

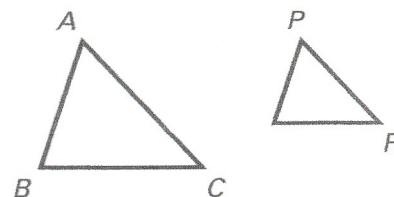
- Goals**
- Use similarity theorems to prove two triangles are similar.
  - Use similar triangles to solve real-life problems.

**THEOREM 8.2: SIDE-SIDE-SIDE (SSS) SIMILARITY THEOREM**

If the lengths of the corresponding sides of two triangles are proportional, then the triangles are similar.

$$\text{If } \frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP},$$

then \_\_\_\_\_.

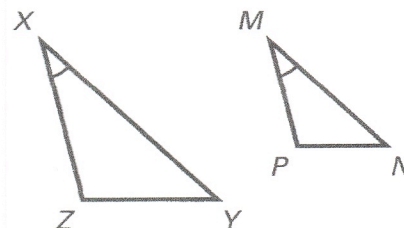


**THEOREM 8.3: SIDE-ANGLE-SIDE (SAS) SIMILARITY THEOREM**

If an angle of one triangle is congruent to an angle of a second triangle and the lengths of the sides including these angles are proportional, then the triangles are similar.

$$\text{If } \angle X \cong \angle M \text{ and } \frac{ZX}{PM} = \frac{XY}{MN},$$

then \_\_\_\_\_.

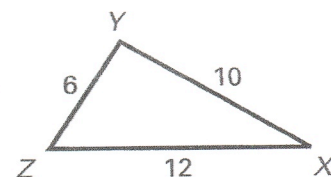
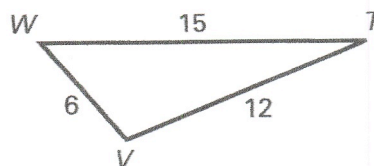
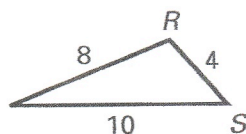




# Example 1

## Using the SSS Similarity Theorem

Which of the following three triangles are similar?



To decide which, if any, of the triangles are similar, you need to consider the ratios of the lengths of corresponding sides.

### Ratios of Side Lengths of QRS and TVW

Shortest sides

Longest sides

Remaining sides

$$\frac{RS}{VW} = \frac{10}{6} = \frac{5}{3}$$

$$\frac{QS}{TW} = \frac{4}{15}$$

$$\frac{QR}{TV} = \frac{8}{12} = \frac{2}{3}$$

Answer Because the ratios are not equal, the triangles are not similar.

### Ratios of Side Lengths of QRS and XYZ

Shortest sides

Longest sides

Remaining sides

$$\frac{RS}{YZ} = \frac{10}{6} = \frac{5}{3}$$

$$\frac{QS}{XZ} = \frac{4}{12} = \frac{1}{3}$$

$$\frac{QR}{XY} = \frac{8}{10} = \frac{4}{5}$$

Answer Because the ratios are not equal, the triangles are not similar.

**Checkpoint** Complete the following exercise.

Ⓐ Are  $\triangle \#1$  and  $\triangle \#2$  similar?

